CAPE ARAGO LIGHT STATION FOOTBRIDGE
(Cape Arago Footbridge)
Gregory Point
Charleston vicinity
Coos
Oregon

HAER OR-156
OR-156

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

REDUCED COPIES OF MEASURED DRAWINGS

FIELD RECORDS

HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
U.S. Department of the Interior
1849 C Street NW
Washington, DC 20240-0001

HISTORIC AMERICAN ENGINEERING RECORD

CAPE ARAGO LIGHT STATION FOOTBRIDGE
(Cape Arago Footbridge)

HAER No. OR-156

Location: The Cape Arago Light Station Footbridge (Cape Arago footbridge) is located on Gregory Point, about 2-1/2 miles west of Charleston, Coos County, Oregon.

USGS Charleston Quadrangle
Universal Transverse Mercator Coordinates: 10.388593.4799513

Present owner: United States Coast Guard (U.S. Coast Guard), Department of Homeland Security

Use: Pedestrian bridge to the Cape Arago Lighthouse on the lighthouse island

Date of construction: 1938: Plans for the footbridge were drafted in the summer of 1938, and construction was completed in the fall of that year.

Engineer and contractor: Engineers in the U.S. Office of Superintendent of Lighthouses, 17th District, Portland, Oregon prepared the plans for the new bridge. Pope and Talbot Lumber Company provided the lumber and specifications for the footbridge. J.K. Johnson, of Medford, Oregon was the contractor.

Significance: Completed in 1938, the Cape Arago footbridge was the third "high" bridge constructed at the Cape Arago Light Station that was established in 1866. The light station is significant for its association with the federal government's efforts to provide safe maritime transportation into the Coos Bay harbor and along the Pacific Northwest coast during a time when Oregon's economy was dependent on the sea for transport and trade. Keepers at the Cape Arago Light Station relied on the footbridge to provide safe access to the lighthouse island.

Over 389' long, the footbridge is also significant as a good example of a Howe pony truss footbridge constructed of locally milled Douglas fir. The bridge was completed in 1938 near the end of the Great Depression, and still serves as the only pedestrian access to the lighthouse island.

The Cape Arago footbridge meets registration requirements as defined by the multiple property submission "Lighthouse Stations of Oregon." The footbridge was listed as a contributing feature to the Cape Arago Light Station. The footbridge and 1934 lighthouse (the only extant structures at the station) were listed in the National Register of Historic Places in 1993. The lighthouse is documented in a separate HABS report entitled "Cape Arago Lighthouse."

PART I. SETTING

A. Geographic Setting:

The Cape Arago Light Station, on the southern Oregon coast, is approximately 2-1/2 miles west of Charleston on the headland known as Gregory Point. The seaward portion of Gregory Point is a narrow, sparsely vegetated headland, approximately 50' above sea level characterized by high, broken cliffs. The Cape Arago Lighthouse is on an island off the northern tip of Gregory Point known as Chief's Island. The entrance to Coos Bay is north of the island.

About 5.91-acres in size, Chief's Island is an irregular-shaped island that has a narrow peninsula at the northern end; the former site of the 1866 lighthouse. Covered with native grasses and bare soil, the size of the island is constantly changing due to coastal erosion. The Cape Arago footbridge spans the distance between the Gregory Point mainland and Chief's Island.

B. Physical Setting:

Cape Arago Highway extends west from Charleston along the coastline until it curves to the south at Lighthouse Way; the road to the lighthouse station. Lighthouse Way is lined with residences and terminates at a gate that secures the Bureau of Land Management (BLM)/Coast Guard property. The access road to the station is a narrow, paved roadway lined with mature firs and low shrubs.

The mainland acreage, now BLM land, was historically part of the lighthouse reserve; the former location of the triplex, garage, sheds, and barn. A Native American burial ground, at the northern edge of the mainland, is associated with the Confederated Tribes of Coos, Lower Umpqua, and Siuslaw Indians. The tribes own an easement to the cemetery.

East of the burial grounds is a narrow, paved walkway that descends to the Cape Arago footbridge. About 42' high, the wood footbridge spans 389' between the high cliffs of the island and mainland.

PART II. ENGINEERING DESCRIPTION

A. Historical Summary of the Cape Arago Footbridge:

The federal government established the Cape Arago Light Station on Chief's Island in 1866. Upon completion, the lighthouse station included a 25' high octagonal tower, lighthouse keeper's residence, and a tramway that connected the island with the mainland. A series of low bridges and cable tramways were built over the next thirty years, but none withstood the harsh coastal weather until 1898, when a "high" footbridge was constructed to serve the needs of the station.

Engineers in the Office of the Superintendent of Lighthouse, 17th District in Portland, Oregon, prepared the plans for the new wooden footbridge. The Pratt truss footbridge was completed in July 1898, and served as the only pedestrian access from the mainland to the lighthouse island for the next twenty-five years. A steel footbridge replaced the wood structure in the 1920s, and served the station for another twenty-five years until the structure was replaced in 1938 with a new wood bridge.

The 17th District lighthouse engineers in Portland, Oregon prepared drawings for the Howe truss design, and Pope and Talbot Lumber Company drafted the specifications and milled the Douglas fir for the bridge. In the fall of 1938, Medford, Oregon contractor, J.K. Johnson, received the contract to build the new footbridge at the light station.

B. Physical Description: 1938 Footbridge:

The Cape Arago footbridge is about 389' long and 42' above sea level. The bridge is comprised of four, eight-panel Howe pony trusses spaced 20' apart. The mainland bridge approach extends north about 34' to the southern-most truss, and the island approach extends 55'-6" to the northern-most truss. The tower bents, under the bridge deck between the trusses, are supported on poured concrete footings. Almost all the wood used in the construction is Douglas treated with creosote.

1. **Superstructure:** The major components of the superstructure include the deck, railing, girders, and trusses. The eight-panel, 60' long Howe pony trusses have vertical and diagonal members between the bottom and top chords. The vertical wood tension members, measuring 4"x4" except for the 2"x4" end verticals, are bolted to the top and bottom chords. Wooden compression members extend at a diagonal between the verticals. The top chord consists of two, 3"x8" horizontal boards secured on either side of the verticals. The top chord is capped with a 2"x10" plank, nailed to the horizontal boards.

   The 12'-0" diagonal members are bolted to the bottom and top chords, and are heavier at the end panels than at mid-span (middle four diagonals measure 4"x4" and the outer diagonals measure 4"x6" and 4"x8"). Each panel within the span measures 7'-6" on center. There are 20'-0" sections between each of the four truss panels; these sections of the footbridge are above the central tower bents. Side railings consist of three horizontal 3"x4" boards, spaced every 12", span the length of the bridge. These are bolted to the 4"x4" vertical bridge members and to 4"x4" vertical posts over the tower bents. The height of the top rail is 3'-0" above the deck.

   The bridge deck, about 7' wide, consists of two layers of 2"x12" diagonal-crossed timbers, laid at 45-degree angles. A layer of 2' wide rolled asphalt, installed more recently for traction, is on top of the wood deck. The deck members, notched around the vertical members, are bolted to the bottom chords. A wood box channel, made of 2"x4" sides and a 2"x8" top and bottom, extends the length of the west side of the deck. Utility lines were once channeled through the box (all the utility lines have been removed). An older electrical cable extends along the outside of the deck.

The bottom chords are constructed of double, 3"x8" boards that are bolted to either side of the vertical truss members. The bottom chords are supported by 11' long lateral cross-beams constructed of 2"x6" boards, spliced, and bolted together on either side of the vertical members. An outrigger at each vertical member, extends from near the top rail, diagonally to the end of the lateral cross-beam supporting the bottom chord. These 56 outriggers provide lateral stability for the top chord. The majority of the bridge connectors are split-ring connectors fastened with 5/8" diameter galvanized steel bolts and malleable washers with the exception of the diagonal fasteners, which are 4" connectors and 3/4" bolts.

The access to the footbridge is restricted. A 9' high chain link fence, with a double locked gate, spans the width of the bridge at the mainland side. Barbwire has been placed above the top rail of the fence.

2. **Substructure:** The Cape Arago footbridge is supported by a series of five tower bents that span the distance of the bridge. The three central bents are the same height while the end bents are shorter conforming to the slope of the inclines at the island and mainland approaches.

   a. **Central three tower bents:** The bridge deck is supported by double 4"x10" girders (bent caps). Diagonal 4"x10" bracing extends from the mid-point of the top girder to the outside ends of the central double 4"x10" sash braces (divide the bents in half horizontally). The top girder is 12'-11-5/8" from the midpoint of the sash brace. The midpoint of the sash brace is 13'-6" from the top of the concrete footing supporting the bent. The lower half of the longitudinal bent is cross-braced with 4"x10" diagonals, 26' long. The diagonal and horizontal members are secured to the vertical members by 5/8" bolts set in 2-1/2" and 11/16" holes.

      The central bents are 21' wide longitudinally (north-south) and about 27' high from the top of the concrete footings. The transverse section of each bent tapers from about 8' at the top to 19' at the bottom. The 4"x10" center sash brace is about 14' long. Cross-braces strengthen the vertical bent members above and below the center sash braces. The upper cross-braces are 4"x10" boards, 18' long; the lower cross-braces are 4"x10" boards, 22' long.

   b. **Mainland approach tower bent**: The mainland approach tower bents are about 27 high from the top of the concrete footings, and 19' wide at the base transversely (east-west). The transverse tower is similar to the center tower in design except the lower half of the structure is not cross-braced. The longitudinal section varies from the central bents because of its construction on the slope of the mainland. The longitudinal elevation is comprised of an inverted L-shaped design that is stabilized by 4"x10" diagonal braces extending from the mainland end down to the middle of the 10"x10" vertical post member.

The horizontal members under the bridge deck extend about 34' from the mainland end to the beginning of the vertical post. Concrete footings support each bent.

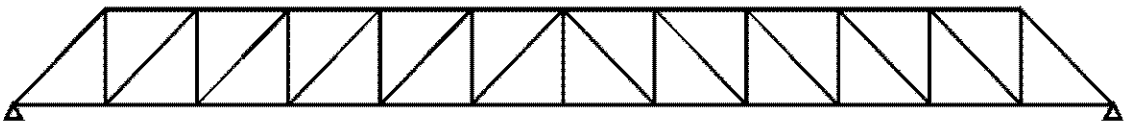
c. **Island approach tower bent:** The longitudinal tower bent nearest the lighthouse island is different in design than the other bridge bents. The bent measures about 17' long from the end of the north edge of the bridge deck to the first vertical post member to the south, about 18' long from the first post to the center of the second vertical post, and 20' long to the first Howe pony truss. The part of the bent closest to the land is a diagonal brace that extends from the midpoint of the upper horizontal member to the bottom of the first vertical post.

The center portion of the bent is cross-braced, and the most southern section of bent has inverted "V" bracing on the top and an off-centered 4"x10" cross-brace below the middle horizontal member. The low bent is 10'-4-3/4" high, the center bent is 20'-3-3/4", and the high bent is 26'-5-1/4". The transverse sections of the bents are cross-braced.

d. **Concrete piers/footings:** The concrete footings (4' to 9' high) taper from about 2' at the top to about 4' at the bottom. These footings were most likely constructed when the previous bridge was erected at the light station in the early 1920s. The 1938 construction drawings for the footbridge indicate that the existing concrete piers were used for the new bridge. The corners of the concrete footings were reinforced with angle irons. The older footings are tied into the newer footings on the two center bents closest to the island (not on the southern-most central footing).

3. **Alterations to the footbridge:** Alterations to the Cape Arago footbridge have been minimal over the last 70 years. In 1959, the bridge footings were reinforced when new concrete was poured around the base of the older footings creating a slightly larger footprint at the base. In the early 1960s, lateral braces were added between the footings on the transverse section of the three, central tower bents. Angle irons were also added to the transverse section of the central bents to strengthen the connection between the vertical bent posts and the foundation system. A 10"x10" vertical support post was added to the northern-most tower bent at a later date.

4. **Howe Truss Bridge Types:** William Howe, a native of western Massachusetts, patented the Howe truss in 1840. Howe designed the truss to utilize both wood and iron structural members. Unlike other bridge engineers of the time, Howe kept the number of structural members needed to a minimum to reduce the overall cost and maintenance of the truss system. The Howe truss vertical members (originally iron) were in tension and the wooden diagonals members were in compression. The Howe truss was known for its simplicity, and ease of construction and maintenance.



Typical Howe Truss Design

The Howe truss was widely used in the United States in the last half of the nineteenth century, especially for railroad bridges. Although other bridge truss systems were invented in the late nineteenth century, the Howe truss continued to be a popular in the twentieth century. Common in Oregon and Washington from the early 1900s through the 1930s, the Howe trusses were frequently used in the Northwest for covered bridges and smaller structures like footbridges. The Pacific Northwest's accessible and abundant timber provided inexpensive building material for wood bridges.

The Cape Arago footbridge, built near the end of the Great Depression, utilized the pony truss design with the deck at the level of the bottom chords and without overhead cross-bracing between the top chords of the truss. The wood bridge was constructed with locally milled Douglas fir and built by a local Oregon contractor. Over the last seventy years, the Cape Arago footbridge has survived the harsh elements of the Southern Oregon coast.

PART III. HISTORICAL OVERVIEW

A. Native Americans of Gregory Point:

Cape Arago Lighthouse was sited on Gregory Point, the ancestral territory of the Milluk Coos, a branch of the Penutian-speaking Coosan language group. The tribe inhabited the south side of the Coos River estuary, and had villages on South Slough at Mussel Reef (Yoakam Point), Sunset Bay, Cape Arago, and Gregory Point.[1]

The tip of Gregory Point was separated from the mainland by wave erosion. According to tradition, the small island tip, called "Baldyasa" (towards the west) by the natives, became home to the village chief. The people of Baldyasa lived in relative isolation, confined between the sea and dense forest along the coastline. Present-day Sunset Bay, a cove that borders Gregory Point on the southwest, provided a sheltered place where the natives stored and launched sea-going canoes.[2]

Although the length of time in which the Milluk Coos village occupied Gregory Point is uncertain, the site is hundreds of years old, possibly reaching as far back as 500 A.D. According to tradition, the village was largely decimated in a raid by the Rogue River

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1 Stephen Dow Beckham, "Historical and Archaeological Resources of the Oregon Coastal Zones: A Resource Inventory Report to the Oregon Coastal Conservation and Development Commission." September 1974.

2 Ibid.

Indians before the time of first contact with Euro-Americans (pre-1850s) and was never re-established. The small islet off Gregory Point, known as Chief's Island, was the site of the first Cape Arago Light Station.[3]

B. Coos Bay and Cape Arago Lighthouse:

In the late 1850s, Coos Bay emerged as an important harbor on the Oregon coast. The timber and coal resources drew settlers and coastal commerce, and the region's river valleys appealed to farmers. Mills and shipyards developed in Coos Bay. Pilings, lumber, and shingles manufactured locally added to the region's economy. Although one of the most dangerous bay entrances, mariners considered Coos Bay one of the best natural harbors between Puget Sound in Washington and San Francisco Bay.

The Coos Bay entrance, its shifting channels and shoals, and the evident need for aids to navigation did not receive the attention of the Light House Board until September 1861, when the U.S. Coast and Geodetic Survey team began an intensive study and hydrology of Coos Bay. While the surveyors were finishing their four-year study, Congress determined that a lighthouse was needed at the entrance to the bay. On 2 July 1864, Congress appropriated $15,000 for the construction of a lighthouse on Gregory Point (Cape Arago) at the northern tip of Chief's Island. The Office of Superintendent of Lighthouses, 17th District in Portland, Oregon, designed the new lighthouse, which was illuminated on 1 November 1866. The light station included the 25' high skeletal iron light structure, a keeper's house, and other support buildings.

C. The Cape Arago Life-Saving Station:

In spite of the lighthouse, several vessels were lost on the bars at the Coos Bay entrance. Many of the local residents relied on the Cape Arago lighthouse keepers to provide life-saving services for those in distress. Although the keepers often were called upon to help, the response time was dependent upon the ocean condition and weather. Local citizens started petitioning for an official life-saving station. On 5 February 1876, the *Coos Bay News* proposed that a station be built at Charleston, about 2-1/2 miles northeast of the lighthouse island.

Although the Light House Board did not build the Charleston station, the board responded by making improvements to the Cape Arago Light Station. A low footbridge between the mainland and the island allowed personnel to cross more quickly. The Light House Board also funded constructed a plank walk from the keeper's dwelling to the lighthouse and replaced the Franklin Lamp in the lens with a double-wick Funck Lamp.[4] Despite this work, storms destroyed the low footbridge, carried away the boathouse in the cove, and broke loose part of the supply tramway on the island.[5]

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[3] Ibid.

[4] U.S. Treasury Department, U.S. Light House Board. "Annual Report of U.S. Lighthouse Board, 1876." Washington D.C.: Government Printing Office.

[5] Ibid.

In 1878, the government yielded, and commissioned the construction of the Cape Arago Life-Saving Station on the lighthouse island. A wood-frame crew station, built on pilings, and boathouse were built in a cove on the south side of the island; an all-volunteer crew serviced the station. The life-saving station remained on the island until 1891, when the facility was moved to the North Spit of Coos Bay.[6]

D. The Cape Arago Footbridges:

In the 1880s, many improvements were made to the Cape Arago station and grounds. Regardless of the efforts of the crew, the weather prevailed when high tides destroyed the footbridge between the island and the mainland, and damaged other buildings at the station. The 1886 *Lighthouse Board Annual Report* noted:

> *A temporary foot-bridge about 40 feet long was built across the lowest part of the opening between the island and the mainland, where the bridge, as stated above, had been. The foot-bridge enables the keepers to cross at stages below half tide, while before a boat was used for all crossings. The tramway for raising supplies from the beach to the bluff was entirely rebuilt.*

Throughout the 1880s, the low footbridge to the island continued to create difficulties for the keepers and their families. In 1899, the government began accepting bids for a high footbridge across the inlet to the station. The Light House Board reported, however, that the bids were too high and none were accepted. Instead, the Board funded the construction of a cable tramway from the mainland to the island. Completed in September 1891, the 400' long cable tramway extended between framed towers on the island and the mainland. A new bridge was not considered again until the late 1890s.

E. The 1898 "High" Footbridges and the Second Cape Arago Lighthouse:

Despite these improvements, access to the island remained difficult, often threatening the lives of the keepers. In 1898, the tram cable broke, injuring a keeper and a family member. This accident prompted the construction of a new footbridge between the island and mainland. Engineers in the Office of Superintendent of Lighthouses, 17th District, in Portland completed plans for the pedestrian "high" bridge. The new 386' long bridge, designed with four, 60' long Pratt trusses, was completed on 28 July 1898, and stood about 40' above the channel on a series of tall tower bents.[7] The bridge served as the main access to the lighthouse for many years.

The inclement weather and erosion on the northern tip of the island, and the increase in commerce in Coos Bay led to the construction of a new lighthouse. The new tower and fog signal building was commissioned in 1907. Light House Board architect/engineer Carl H. Leick designed the new structure that was sited on the broadest point of the

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[6] The life-saving station was moved to Charleston, Oregon in 1916.

[7] U.S. Treasury Department, U.S. Light House Board. "Annual Report of U.S. Lighthouse Board, 1899." Washington D.C.: Government Printing Office.

island, south of the original tower. Construction of the new lighthouse started in 1908 and completed when the fourth-order Fresnel lens was illuminated on 1 July 1909.

Shortly after the new lighthouse was finished, the government reorganized the Light House Board creating the Bureau of Light Houses (Bureau). The Bureau was charged with the care and management of the lighthouses. It was under the Bureau's watch that other improvements were made to the Cape Arago station over the next two decades. A storage shed and water tank were built on the mainland, and in the early 1920s, the 1898 footbridge was replaced with a sturdier metal footbridge that provided a safer crossing to and from the mainland.

F. The Light Station in the 1930s and the New 1938 Footbridge:

In the early 1930s, lighthouse keeper Wyman Albee recommended improvements to the Cape Arago lighthouse tower and fog signal building in his annual report. As a result, Congress appropriated funds for a new Cape Arago lighthouse.

The government hired Marshfield contractor, Rudolph "Rudy" Jake Hillstrom to erect the new reinforced concrete light tower and fog signal building. Plans for the new structure were drawn in the Portland district office. The initial plans were completed on 7 March 1933, and revisions made from July to September.

The new lighthouse was built on the footprint of the 1909 lighthouse. Hillstrom and his crew moved the 1909 structure south of its original location, and remodeled it into offices for the keepers. The reinforced concrete lighthouse was built with an octagonal light tower attached to the southern facade of the fog signal building. The Fresnel lens was removed from the 1909 lighthouse and placed in the new light tower. The lighthouse was illuminated in 1934.

Five years after the new light was completed, the Bureau constructed a new high footbridge. The Office of Superintendent of Lighthouses, 17th District, Portland, Oregon, completed drawings for the Howe truss footbridge on 22 July 1938. The drawings were revised in August, and construction started in the fall.

Pope & Talbot Lumber Company, a regional lumber company, was hired to draft specification drawings for the type and amount of lumber needed for the new bridge. The creosoting department produced the drawings at the end of August for the new Howe pony truss footbridge. Shortly after the plans were finished, the Bureau hired J.F. Johnson, a contractor from Newberg, Oregon, to erect the new structure for $6,200. The 26 August 1938 Marshfield's *Southwestern Oregon News* states,

> *Low bidder on a bridge to replace the present steel structure from the mainland across a narrow gorge to the Cape Arago lighthouse was J.F. Johnson, Newberg, it was learned here Tuesday. Johnson's bid was $6,200. The present bridge was condemned following a recent inspection. The new bridge is to be of wood, it was reported.*

Following the Pope and Talbot plans, Johnson constructed the wooden Howe pony truss footbridge using local laborers. The new footbridge was built using portions of the 1920s foundation system, and constructed of locally milled Douglas fir. Approximately 389' in length, the footbridge was 42' above the channel when it was completed in 1938.

The footbridge to the lighthouse island has served as the main pedestrian access to the island for 70-years, and is a testament to the quality of materials and artisanship used in the construction of the bridge.

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D. Supplemental Material:

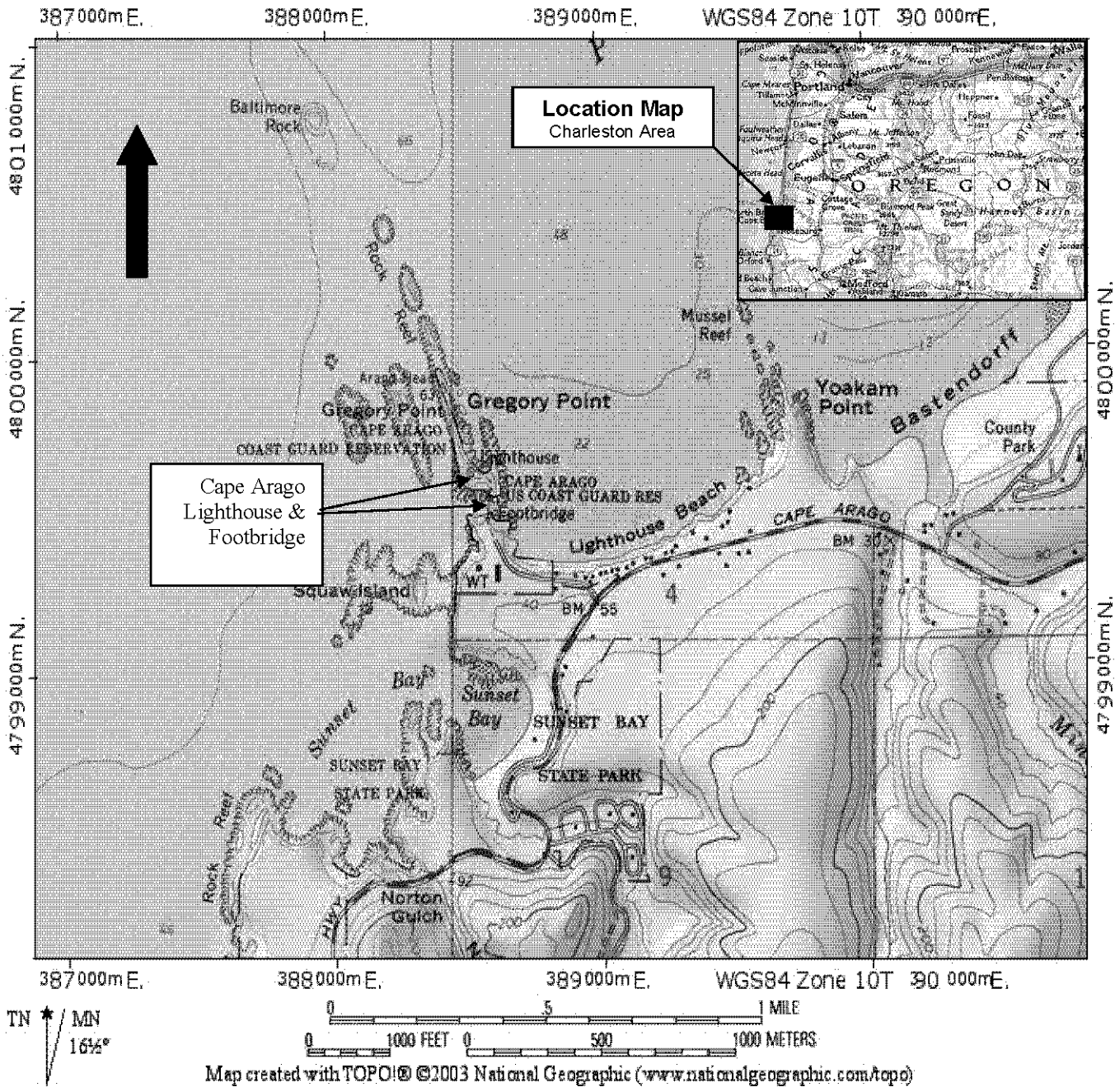
See attached.

PART IV. PROJECT INFORMATION

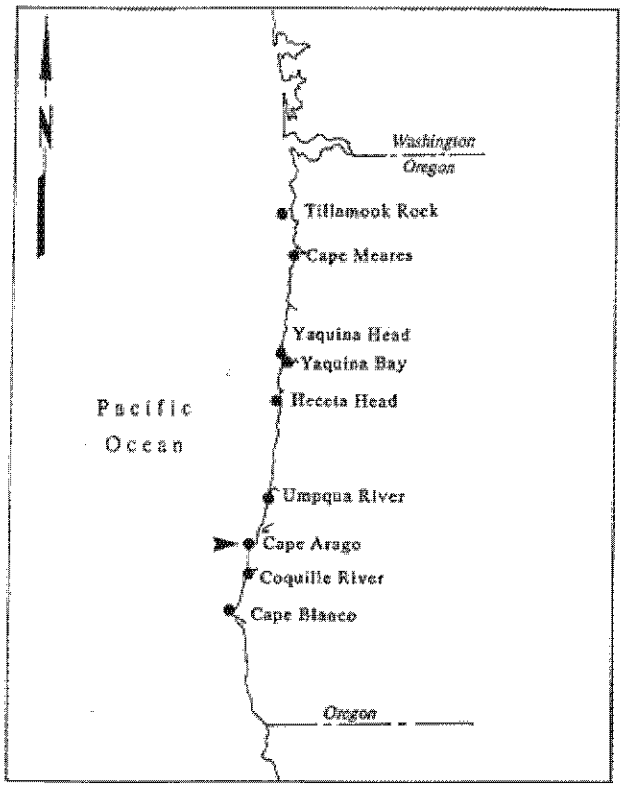
Sally Donovan, M.S., Donovan and Associates, a historic preservation consultant in Hood River, Oregon, conducted the field investigation and measurements, and took the large format and 35mm black and white photographs of the footbridge and site in May 2008. Donovan completed the historic research and copied original architectural/engineering plans and photographs in the U.S. Coast Guard Civil Engineering Unit, Oakland, California; U.S. Coast Guard Museum in Seattle, Washington; and the U.S. Lighthouse Society in Hansville, Washington. Research was also conducted in the U.S. Coast Guard ANT Coos Bay Engineering Unit in Charleston, Oregon, and the public library in Coos Bay, Oregon. Donovan drafted the report, and prepared the supplemental material and photographs for the HAER submission.

Bruce Howard, an associate with Donovan and Associates, assisted with the fieldwork, measurements, and research. Howard prepared some of the site plans, supplemental material, and produced the photograph logs. Brian Haug, B.S.E.M.T., produced the CAD drawings for the footbridge using field measurements and previously drafted plans and specifications.

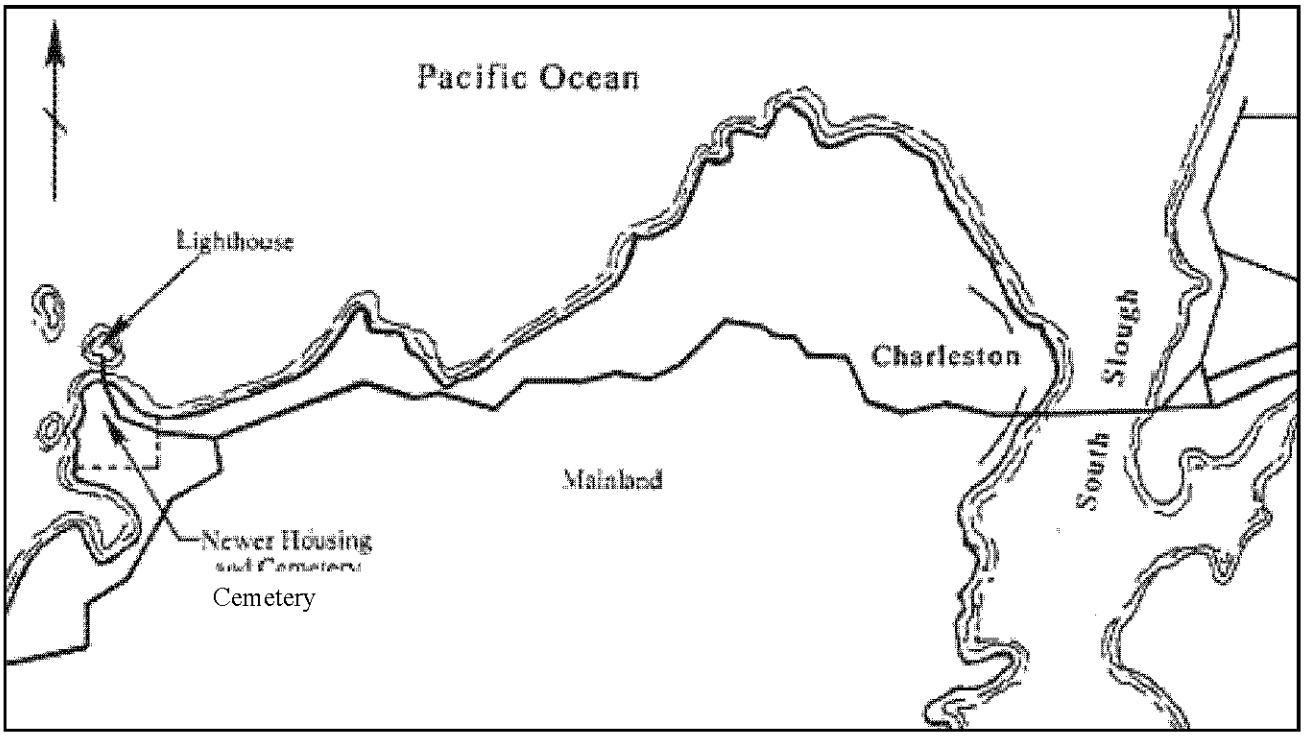
Amanda Velasquez, Environmental Protection Specialist, U.S. Coast Guard Civil Engineering Unit, Oakland, California; and Peggy Bloisa, P.G., CDM, Walnut Creek, California edited the HAER report as part of the review process.



USGS 7.5 Minute Topographic Map-Charleston Quadrangle

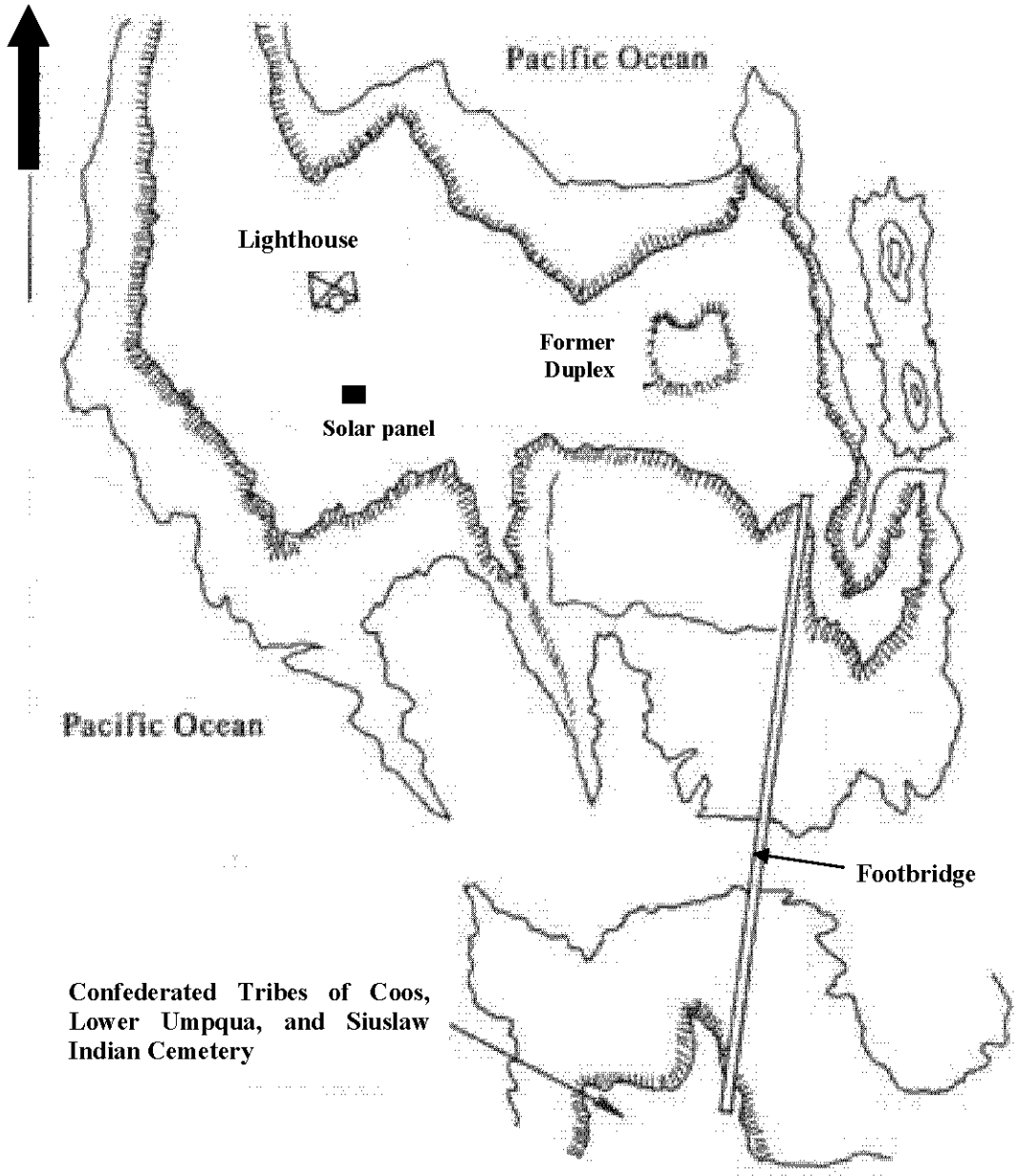


Location of Oregon Coastal Lighthouses.



CAPE ARAGO LIGHT STATION FOOTBRIDGE

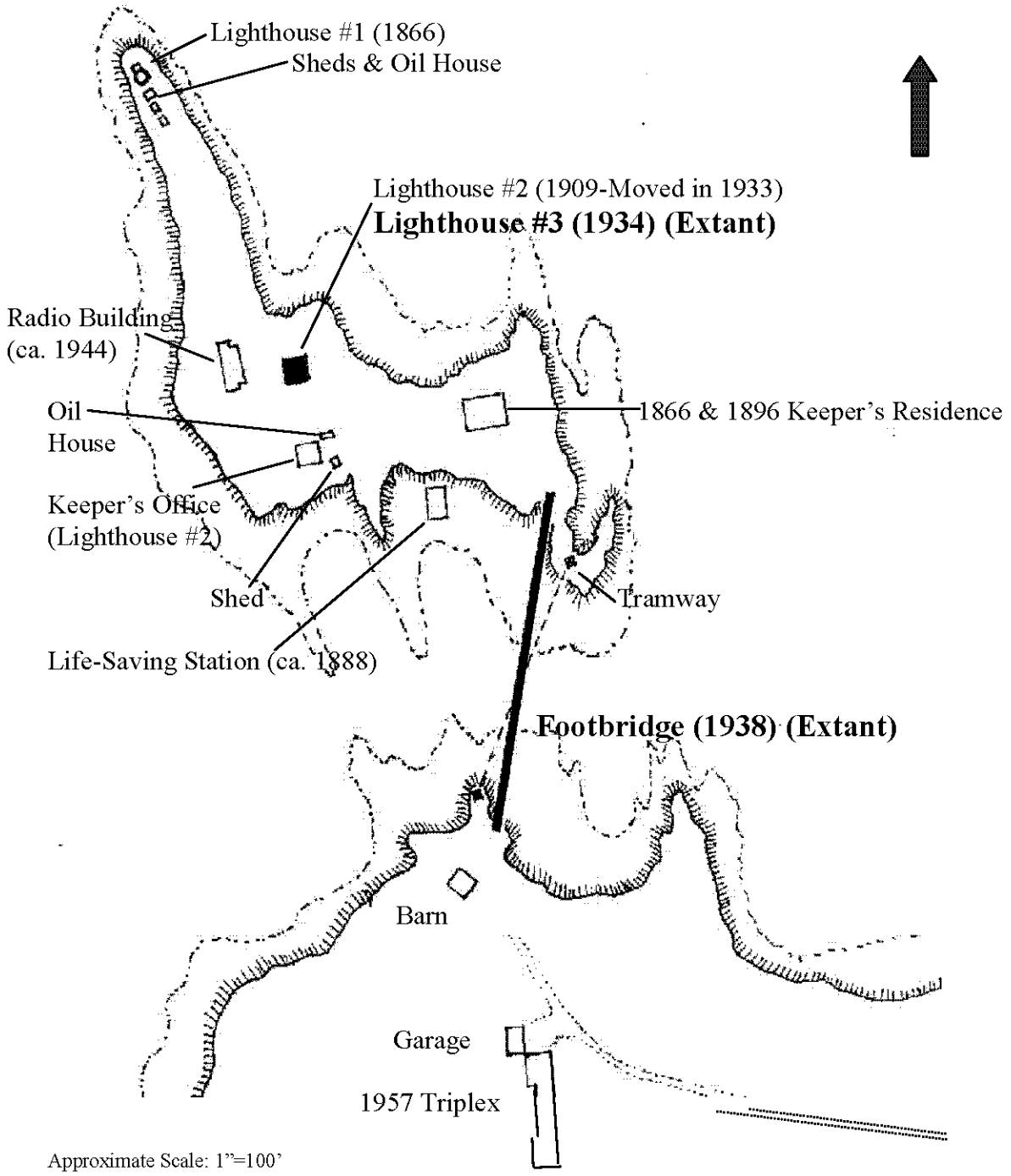
Location of Cape Arago Light Station in relationship to Charleston, OR



Current Structures at the Cape Arago Light Station

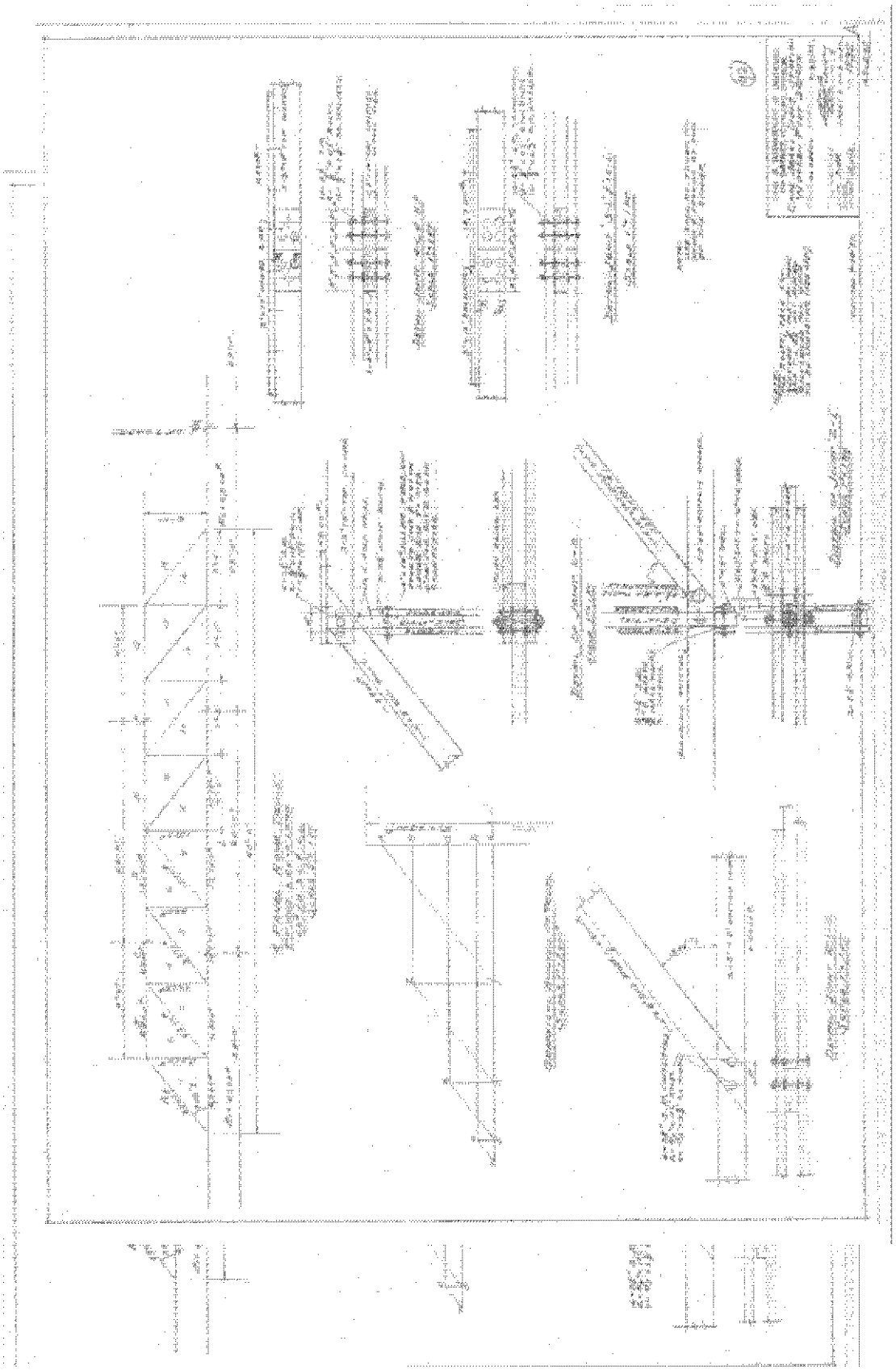
SKETCH MAP

HABS No. OR-156



Note: Lighthouse #3 and the 1938 footbridge are the only extant resources at the Cape Arago Station

Approximate location of the previous and currrent light station buildings



Cape Arago Light Station Footbridge. Office of Superintendent of Lighthouses, 17th District, Portland, Oregon. Drawing No. 1232, July 22, 1938.

Cape Arago Light Station on 12 June 1947 showing 1909 lighthouse (moved & renovated into an office), 1934 lighthouse, radio building, and 1938 high bridge.
U.S. Coast Guard Museum Northwest Collection, Seattle, WA.

Cape Arago Light Station. Historic view looking northwest at 1908 lighthouse and first "high" bridge erected in 1898. Circa 1910. U.S. Coast Guard Museum Northwest Collection, Seattle, WA.

Cape Arago Light Station on 12 June 1947 showing 1909 lighthouse (moved & renovated into an office), 1934 lighthouse, radio building, duplex, 1938 high bridge, and garage on the mainland. U.S. Coast Guard Museum Northwest Collection, Seattle, WA.